AMENDMENTS TO THE CLAIMS

Claims 1-60 (Canceled)

Claim 61 (Previously Presented): A device for recovering a high frequency content of a wideband signal previously down-sampled and for injecting said high frequency content in an over-sampled synthesized version of said wideband signal to produce a full-spectrum synthesized wideband signal, said high-frequency content recovering device comprising:

a) a random noise generator for producing a noise sequence having a given spectrum;

b) a spectral shaping unit for shaping the spectrum of the noise sequence in relation to linear prediction filter coefficients related to said down-sampled wideband signal; and

c) a signal injection circuit for injecting said spectrally-shaped noise sequence in said over-sampled synthesized signal version to thereby produce said full-spectrum synthesized wideband signal.

Claim 62 (Previously Presented): A high-frequency content recovering device as defined in claim 61, wherein said random noise generator is a random white noise generator for producing a white noise sequence having a flat spectrum over the entire frequency bandwidth of the wideband signal, whereby said spectral shaping unit produces a spectrally-shaped white noise sequence.

Claim 63 (Previously Presented): A high-frequency content recovering device as defined in claim 62, wherein said spectral shaping unit comprises:

a) a gain adjustment module, responsive to said white noise sequence and a set of gain adjusting parameters, for producing a scaled white noise sequence;

b) a spectral shaper for filtering said scaled white noise sequence in relation to a bandwidth expanded version of said linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of said over-sampled synthesized signal version; and

c) a band-pass filter responsive to said filtered scaled white noise sequence for producing a

band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 64 (Previously Presented): A method for recovering a high frequency content of a wideband signal previously down-sampled and for injecting said high frequency content in an over-sampled synthesized version of said wideband signal to produce a full-spectrum synthesized wideband signal, said high-frequency content recovering method comprising:

a) randomly generating a noise sequence having a given spectrum;

b) spectrally-shaping said noise sequence in relation to linear prediction filter coefficients related to said down-sampled wideband signal; and

c) injecting said spectrally-shaped noise sequence in said over-sampled synthesized signal version to thereby produce said full-spectrum synthesized wideband signal.

Claim 65 (Previously Presented): A high-frequency content recovering method as defined in claim 64, wherein generating said noise sequence comprises randomly generating a white noise sequence whereby said spectral shaping of the noise sequence produces a spectrally-shaped white noise sequence.

Claim 66 (Previously Presented): A high-frequency content recovering method as defined in claim 65, wherein said spectral shaping of the noise sequence comprises:

a) producing a scaled white noise sequence in response to said white noise sequence and a set of gain adjusting parameters;

b) filtering said scaled white noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of said over-sampled synthesized signal version; and

c) band-pass filtering said filtered scaled white noise sequence to produce a band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 67 (Previously Presented): A decoder for producing a synthesized wideband signal, comprising:

a) a signal fragmenting device for receiving an encoded version of a wideband signal previously down-sampled during encoding and extracting from said encoded wideband signal version at least pitch codebook parameters, innovative codebook parameters, and linear prediction filter coefficients;

b) a pitch codebook responsive to said pitch codebook parameters for producing a pitch codevector;

c) an innovative codebook responsive to said innovative codebook parameters for producing an innovative codevector;

d) a combiner circuit for combining said pitch codevector and said innovative codevector to thereby produce an excitation signal;

e) a signal synthesis device including a linear prediction filter for filtering said excitation signal in relation to said linear prediction filter coefficients to thereby produce a synthesized wideband signal, and an oversampler responsive to said synthesized wideband signal for producing an over-sampled signal version of the synthesized wideband signal; and

f) a high-frequency content recovering device comprising:

i) a random noise generator for producing a noise sequence having a given spectrum;

ii) a spectral shaping unit for shaping the spectrum of the noise sequence in relation to linear prediction filter coefficients related to said down-sampled wideband signal; and

iii) a signal injection circuit for injecting said spectrally-shaped noise sequence in said over-sampled synthesized signal version to thereby produce said full-spectrum synthesized wideband signal.

Claim 68 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 67, wherein said random noise generator comprises a random white noise generator for producing a white noise sequence whereby said spectral shaping unit produces a spectrally-shaped white noise sequence.

Claim 69 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 8, wherein said spectral shaping unit comprises:

a) a gain adjustment module, responsive to said white noise sequence and a set of gain adjusting parameters, for producing a scaled white noise sequence;

b) a spectral shaper for filtering said scaled white noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of said over-sampled synthesized signal version; and

c) a band-pass filter responsive to said filtered scaled white noise sequence for producing a band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 70 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 69, further comprising:

a) a voicing factor generator responsive to said adaptive and innovative codevectors for calculating a voicing factor for forwarding to said gain adjustment module;

b) an energy computing module responsive to said excitation signal for calculating an excitation energy for forwarding to said gain adjustment module; and

c) a spectral tilt calculator responsive to said synthesized signal for calculating a tilt scaling factor for forwarding to said gain adjustment module;

wherein said set of gain adjusting parameters comprises said voicing factor, said ~~energy scaling factor~~ excitation energy, and said tilt scaling factor.

Claim 71 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 70, wherein said voicing factor generator comprises a means for calculating said voicing factor r_v using the relation :

$$r_v = (E_v - E_c) / (E_v + E_c)$$

where E_v is the energy of a gain-scaled version of the pitch codevector and E_c is the energy of a gain-scaled version of the innovative codevector.

Claim 72 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 70, wherein said gain adjustment ~~unit~~ module comprises a means for calculating an energy scaling factor using the relation:

$$\text{Energy scaling factor} = \sqrt{\frac{\sum_{n=0}^{N-1} u'^2(n)}{\sum_{n=0}^{N-1} w'^2(n)}} \quad , n = 0, \ldots, N'-1,$$

where w' is said white noise sequence ~~and~~ , u' is an enhanced excitation signal derived from said excitation signal, N' is a length of the white noise sequence and N is a subframe length.

Claim 73 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 70, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 1 - tilt \qquad \text{bounded by } 0.2 \leq g_t \leq 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,

wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,...N-1.

Claim 74 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 70, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 10^{-0.6tilt} \qquad \text{bounded by } 0.2 \leq g_t \leq 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,

wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,...N-1.

Claim 75 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 69, wherein said band-pass filter comprises a frequency bandwidth located between 5.6 kHz and 7.2 kHz.

Claim 76 (Currently Amended): A decoder for producing a synthesized wideband signal, comprising:

a) a signal fragmenting device for receiving an encoded version of a wideband signal previously down-sampled during encoding and extracting from said encoded wideband signal version at least pitch codebook parameters, innovative codebook parameters, and ~~linerar~~ linear prediction filter coefficients;

b) a pitch codebook responsive to said pitch codebook parameters for producing a pitch

codevector;

c) an innovative codebook responsive to said innovative codebook parameters for producing an innovative codevector;

d) a combiner circuit for combining said pitch codevector and said innovative codevector to thereby produce an excitation signal; and

e) a signal synthesis device including a linear prediction filter for filtering said excitation signal in relation to said linear prediction filter coefficients to thereby produce a synthesized wideband signal, and an oversampler responsive to said synthesized wideband signal for producing an over-sampled signal version of the synthesized wideband signal;

the improvement a high-frequency content recovering device comprising:

i) a random noise generator for producing a noise sequence having a given spectrum;

ii) a spectral shaping unit for shaping the spectrum of the noise sequence in relation to linear prediction filter coefficients related to said down-sampled wideband signal; and

iii) a signal injection circuit for injecting said spectrally-shaped noise sequence in said over-sampled synthesized signal version to thereby produce said full-spectrum synthesized wideband signal.

Claim 77 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 76, wherein said random noise generator comprises a random white noise generator for producing a white noise sequence whereby said spectral shaping unit produces a spectrally-shaped white noise sequence.

Claim 78 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 77, wherein said spectral shaping unit comprises:

a) a gain adjustment module, responsive to said white noise sequence and a set of gain adjusting parameters, for producing a scaled white noise sequence;

b) a spectral shaper for filtering said scaled white noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of

said over-sampled synthesized signal version; and

c) a band-pass filter responsive to said filtered scaled white noise sequence for producing a band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 79 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 78, further comprising:

a) a voicing factor generator responsive to said adaptive and innovative codevectors for calculating a voicing factor for forwarding to said gain adjustment module;

b) an energy computing module responsive to said excitation signal for calculating an excitation energy for forwarding to said gain adjustment module; and

c) a spectral tilt calculator responsive to said synthesized signal for calculating a tilt scaling factor for forwarding to said gain adjustment module;

wherein said set of gain adjusting parameters comprises said voicing factor, said ~~energy scaling factor~~ excitation energy, and said tilt scaling factor.

Claim 80 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 79, wherein said voicing factor generator comprises a means for calculating said voicing factor r_v using the relation :

$$r_v = (E_v - E_c) / (E_v + E_c)$$

where E_v is the energy of a gain-scaled version of the pitch codevector and E_c is the energy of a gain-scaled version of the innovative codevector.

Claim 81 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 79, wherein said gain ~~adjusting unit~~ adjustment module comprises a means for calculating an energy scaling factor using the relation:

$$Energy\ scaling\ factor = \sqrt{\frac{\sum_{n=0}^{N-1} u'^2(n)}{\sum_{n=0}^{N'-1} w'^2(n)}} \quad , n = 0, \ldots, N'-1,$$

where w' is said white noise sequence ~~and~~ , u' is an enhanced excitation signal derived from said excitation signal, N' is a length of the white noise sequence and N is a subframe length.

Claim 82 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 79, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 1 - tilt \qquad \text{bounded by } 0.2 \le g_t \le 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \ge 0$ et $tilt \ge r_v$,
wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,…N-1.

Claim 83 (Currently Amended): A decoder for producing a synthesized wideband signal as defined in claim 79, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 10^{-0.6tilt} \qquad \text{bounded by } 0.2 \le g_t \le 1.0$$

where *tilt* is a tilt factor given by :

$$tilt=\frac{\sum_{n=1}^{N-1} s_h(n)s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,

wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,...N-1.

Claim 84 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 78, wherein said band-pass filter comprises a frequency bandwidth located between 5.6 kHz and 7.2 kHz.

Claim 85 (Currently Amended): A cellular communication system for servicing a ~~large~~ geographical area divided into a plurality of cells, comprising:

a) mobile transmitter/receiver units;

b) cellular base stations respectively situated in said cells;

c) a control terminal for controlling communication between the cellular base stations;

d) a bidirectional wireless communication sub-system between each mobile unit situated in one cell and the cellular base station of said one cell, said bidirectional wireless communication subsystem comprising, in both the mobile unit and the cellular base station:

i) a transmitter including an encoder for encoding a wideband signal and a transmission circuit for transmitting the encoded wideband signal; and

ii) a receiver including a receiving circuit for receiving a transmitted encoded wideband signal and a decoder for decoding the received encoded wideband signal, said decoder comprising:

(1) a signal fragmenting device for receiving an encoded version of a

wideband signal previously down-sampled during encoding and extracting from said encoded wideband signal version at least pitch codebook parameters, innovative codebook parameters, and linear prediction filter coefficients;

(2) a pitch codebook responsive to said pitch codebook parameters for producing a pitch codevector;

(3) an innovative codebook responsive to said innovative codebook parameters for producing an innovative codevector;

(4) a combiner circuit for combining said pitch codevector and said innovative codevector to thereby produce an excitation signal;

(5) a signal synthesis device including a linear prediction filter for filtering said excitation signal in relation to said linear prediction filter coefficients to thereby produce a synthesized wideband signal, and an oversampler responsive to said synthesized wideband signal for producing an over-sampled signal version of the synthesized wideband signal; and

(6) a high-frequency content recovering device comprising:

a) a random noise generator for producing a noise sequence having a given spectrum;

b) a spectral shaping unit for shaping the spectrum of the noise sequence in relation to linear prediction filter coefficients related to said down-sampled wideband signal; and

c) a signal injection circuit for injecting said spectrally-shaped noise sequence in said over-sampled synthesized signal version to thereby produce said full-spectrum synthesized wideband signal.

Claim 86 (Previously Presented): A cellular communication system as defined in claim 85, wherein said random noise generator comprises a random white noise generator for producing a white noise sequence whereby said spectral shaping unit produces a spectrally-shaped white noise sequence.

Claim 87 (Previously Presented): A cellular communication system as defined in claim 86, wherein said spectral shaping unit comprises:

a) a gain adjustment module, responsive to said white noise sequence and a set of gain adjusting parameters, for producing a scaled white noise sequence;

b) a spectral shaper for filtering said scaled white noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of said over-sampled synthesized signal version; and

c) a band-pass filter responsive to said filtered scaled white noise sequence for producing a band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 88 (Currently Amended): A cellular communication system as defined in claim 87, further comprising:

a) a voicing factor generator responsive to said adaptive and innovative codevectors for calculating a voicing factor for forwarding to said gain adjustment module;

b) an energy computing module responsive to said excitation signal for calculating an excitation energy for forwarding to said gain adjustment module; and

c) a spectral tilt calculator responsive to said synthesized signal for calculating a tilt scaling factor for forwarding to said gain adjustment module;

wherein said set of gain adjusting parameters comprises said voicing factor, said ~~energy scaling factor~~ excitation energy, and said tilt scaling factor.

Claim 89 (Previously Presented): A cellular communication system as defined in claim 88, wherein said voicing factor generator comprises a means for calculating said voicing factor r_v using the relation :

$$r_v = (E_v - E_c) / (E_v + E_c)$$

where E_v is the energy of a gain-scaled version of the pitch codevector and E_c is the energy of a gain-scaled version of the innovative codevector.

Claim 90 (Currently Amended): A cellular communication system as defined in claim 88, wherein said gain ~~adjusting unit~~ adjustment module comprises a means for calculating an energy scaling factor using the relation:

$$Energy\ scaling\ factor = \sqrt{\frac{\sum_{n=0}^{N-1} u'^2(n)}{\sum_{n=0}^{N'-1} w'^2(n)}} \quad , n = 0, \ldots, N'\text{-}1,$$

where w' is said white noise sequence ~~and~~ , u' is an enhanced excitation signal derived from said excitation signal, N' is a length of the white noise sequence and N is a subframe length.

Claim 91 (Currently Amended): A cellular communication system as defined in claim 88, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 1 - tilt \qquad \text{bounded by } 0.2 \le g_t \le 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \ge 0$ et $tilt \ge r_v$,
wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,…N-1.

Claim 92 (Currently Amended): A cellular communication system as defined in claim 88, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 10^{-0.6tilt} \qquad \text{bounded by } 0.2 \leq g_t \leq 1.0$$

where <u>*tilt* is a tilt factor given by :</u>

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_{v_2}$

<u>wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,...N-1</u>.

Claim 93 (Previously Presented): A cellular communication system as defined in claim 87, wherein said band-pass filter comprises a frequency bandwidth located between 5.6 kHz and 7.2 kHz.

Claim 94 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit comprising:

~~a) a transmitter including an encoder for encoding a wideband signal and a transmission circuit for transmitting the encoded wideband signal; and~~

~~b)~~ a receiver including a receiving circuit for receiving a transmitted encoded wideband signal and a decoder for decoding the received encoded wideband signal, said decoder comprising:

i) a signal fragmenting device for receiving an encoded version of a wideband signal previously down-sampled during encoding and extracting from said encoded wideband signal version at least pitch codebook parameters, innovative codebook parameters, and linear prediction filter coefficients;

ii) a pitch codebook responsive to said pitch codebook parameters for producing a pitch codevector;

iii) an innovative codebook responsive to said innovative codebook parameters for producing an innovative codevector;

iv) a combiner circuit for combining said pitch codevector and said innovative codevector to thereby produce an excitation signal;

v) a signal synthesis device including a linear prediction filter for filtering said excitation signal in relation to said linear prediction filter coefficients to thereby produce a synthesized wideband signal, and an oversampler responsive to said synthesized wideband signal for producing an over-sampled signal version of the synthesized wideband signal; and

vi) a high-frequency content recovering device comprising:

(1) a random noise generator for producing a noise sequence having a given spectrum;

(2) a spectral shaping unit for shaping the spectrum of the noise sequence in relation to linear prediction filter coefficients related to said down-sampled wideband signal; and

(3) a signal injection circuit for injecting said spectrally-shaped noise sequence in said over-sampled synthesized signal version to thereby produce said full-spectrum synthesized wideband signal.

Claim 95 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 94, wherein said random noise generator comprises a random white noise generator for producing a white noise sequence whereby said spectral shaping unit produces a spectrally-shaped white noise sequence.

Claim 96 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 95, wherein said spectral shaping unit comprises:

a) a gain adjustment module, responsive to said white noise sequence and a set of gain adjusting parameters, for producing a scaled white noise sequence;

b) a spectral shaper for filtering said scaled white noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of said over-sampled synthesized signal version; and

c) a band-pass filter responsive to said filtered scaled white noise sequence for producing a band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 97 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 96, further comprising:

a) a voicing factor generator responsive to said adaptive and innovative codevectors for calculating a voicing factor for forwarding to said gain adjustment module;

b) an energy computing module responsive to said excitation signal for calculating an excitation energy for forwarding to said gain adjustment module; and

c) a spectral tilt calculator responsive to said synthesized signal for calculating a tilt scaling factor for forwarding to said gain adjustment module;

wherein said set of gain adjusting parameters comprises said voicing factor, said ~~energy scaling factor~~ excitation energy, and said tilt scaling factor.

Claim 98 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 97, wherein said voicing factor generator comprises a means for calculating said voicing factor r_v using the relation :

$$r_v = (E_v - E_c) / (E_v + E_c)$$

where E_v is the energy of a gain-scaled version of the pitch codevector and E_c is the energy of a gain-scaled version of the innovative codevector.

Claim 99 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 97, wherein said gain ~~adjusting unit~~ adjustment module comprises a means for calculating an energy scaling factor using the relation:

$$\textit{Energy scaling factor} = \sqrt{\frac{\sum_{n=0}^{N-1} u'^2(n)}{\sum_{n=0}^{N'-1} w'^2(n)}} \quad , n = 0, \ldots, N'-1,$$

where w' is said white noise sequence ~~and~~ , u' is an enhanced excitation signal derived from said excitation signal, N' is a length of the white noise sequence and N is a subframe length.

Claim 100 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 97, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 1 - tilt \qquad \text{bounded by } 0.2 \le g_t \le 1.0$$

where $tilt$ is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \ge 0$ et $tilt \ge r_v$,

wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,…N-1.

Claim 101 (Currently Amended): A mobile ~~cellular~~ mobile transmitter/receiver unit as defined in claim 97, wherein said spectral tilt calculator ~~comprising~~ comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 10^{-0.6tilt} \qquad \text{bounded by } 0.2 \leq g_t \leq 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,

wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,...N-1.

Claim 102 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 96, wherein said band-pass filter comprises a frequency bandwidth located between 5.6 kHz and 7.2 kHz.

Claim 103 (Currently Amended): A ~~cellular~~ communication network element comprising:

~~a) a transmitter including an encoder for encoding a wideband signal and a transmission circuit for transmitting the encoded wideband signal; and~~

~~b)~~ a receiver including a receiving circuit for receiving a transmitted encoded wideband signal and a decoder as recited in claim 67 for decoding the received encoded wideband signal.

Claim 104 (Currently Amended): A ~~cellular~~ communication network element as defined in claim 103, wherein said random noise generator comprises a random white noise generator for producing

a white noise sequence whereby said spectral shaping unit produces a spectrally-shaped white noise sequence.

Claim 105 (Currently Amended): A ~~cellular~~ communication network element as defined in claim 104, wherein said spectral shaping unit comprises:

a) a gain adjustment module, responsive to said white noise sequence and a set of gain adjusting parameters, for producing a scaled white noise sequence;

b) a spectral shaper for filtering said scaled white noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of said over-sampled synthesized signal version; and

c) a band-pass filter responsive to said filtered scaled white noise sequence for producing a band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 106 (Currently Amended): A ~~cellular~~ communication network element as defined in claim 105, further comprising:

a) a voicing factor generator responsive to said adaptive and innovative codevectors for calculating a voicing factor for forwarding to said gain adjustment module;

b) an energy computing module responsive to said excitation signal for calculating an excitation energy for forwarding to said gain adjustment module; and

c) a spectral tilt calculator responsive to said synthesized signal for calculating a tilt scaling factor for forwarding to said gain adjustment module;

wherein said set of gain adjusting parameters comprises said voicing factor, said ~~energy scaling factor~~ excitation energy, and said tilt scaling factor.

Claim 107 (Currently Amended): A ~~cellular~~ communication network element as defined in claim 106, wherein said voicing factor generator comprises a means for calculating said voicing factor r_v using the relation :

$$r_v = (E_v - E_c) / (E_v + E_c)$$

where E_v is the energy of a gain-scaled version of the pitch codevector and E_c is the energy of a gain-scaled version of the innovative codevector.

Claim 108 (Currently Amended): A ~~cellular~~ communication network element as defined in claim 106, wherein said gain ~~adjusting unit~~ adjustment module comprises a means for calculating an energy scaling factor using the relation:

$$Energy\ scaling\ factor = \sqrt{\frac{\sum_{n=0}^{N-1} u'^2(n)}{\sum_{n=0}^{N'-1} w'^2(n)}}\quad , n = 0,\ \ldots,\ N'\text{-}1,$$

where w' is said white noise sequence ~~and~~ , u' is an enhanced excitation signal derived from said excitation signal, N' is a length of the white noise sequence and N is a subframe length.

Claim 109 (Currently Amended): A ~~cellular~~ communication network element as defined in claim 106, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 1 - tilt \qquad \text{bounded by } 0.2 \le g_t \le 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n)s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,

<u>wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,…N-1</u>.

Claim 110 (Currently Amended): A ~~cellular~~ <u>communication</u> network element as defined in claim 106, wherein said spectral tilt calculator ~~comprising~~ <u>comprises</u> a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 10^{-0.6tilt} \qquad \text{bounded by } 0.2 \leq g_t \leq 1.0$$

where <u>*tilt* is a tilt factor given by :</u>

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n)s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,

<u>wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,…N-1</u>.

Claim 111 (Currently Amended): A ~~cellular~~ <u>communication</u> network element as defined in claim 105, wherein said band-pass filter comprises a frequency bandwidth located between 5.6 kHz and 7.2 kHz.

Claim 112 (Currently Amended): In a cellular communication system for servicing a ~~large~~ geographical area divided into a plurality of cells, comprising: mobile transmitter/receiver units;

cellular base stations, respectively situated in said cells; and a control terminal for controlling communication between the cellular base stations:

a bidirectional wireless communication sub-system between each mobile unit situated in one cell and the cellular base station of said one cell, said bidirectional wireless communication sub-system comprising, in both the mobile unit and the cellular base station:

a) a transmitter including an encoder for encoding a wideband signal and a transmission circuit for transmitting the encoded wideband signal; and

b) a receiver including a receiving circuit for receiving a transmitted encoded wideband signal and a decoder as recited in claim 67 for decoding the received encoded wideband signal.

Claim 113 (Previously Presented): A bidirectional wireless communication sub-system as defined in claim 112, wherein said random noise generator comprises a random white noise generator for producing a white noise sequence whereby said spectral shaping unit produces a spectrally-shaped white noise sequence.

Claim 114 (Previously Presented): A bidirectional wireless communication sub-system as defined in claim 113, wherein said spectral shaping unit comprises:

a) a gain adjustment module, responsive to said white noise sequence and a set of gain adjusting parameters, for producing a scaled white noise sequence;

b) a spectral shaper for filtering said scaled white noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered scaled white noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of said over-sampled synthesized signal version; and

c) a band-pass filter responsive to said filtered scaled white noise sequence for producing a band-pass filtered scaled white noise sequence to be subsequently injected in said over-sampled synthesized signal version as said spectrally-shaped white noise sequence.

Claim 115 (Currently Amended): A bidirectional wireless communication sub-system as defined in claim 114, further comprising:

a) a voicing factor generator responsive to said adaptive and innovative codevectors for calculating a voicing factor for forwarding to said gain adjustment module;

b) an energy computing module responsive to said excitation signal for calculating an excitation energy for forwarding to said gain adjustment module; and

c) a spectral tilt calculator responsive to said synthesized signal for calculating a tilt scaling factor for forwarding to said gain adjustment module;

wherein said set of gain adjusting parameters comprises said voicing factor, said ~~energy scaling factor~~ excitation energy, and said tilt scaling factor.

Claim 116 (Previously Presented): A bidirectional wireless communication sub-system as defined in claim 115, wherein said voicing factor generator comprises a means for calculating said voicing factor r_v using the relation :

$$r_v = (E_v - E_c) / (E_v + E_c)$$

where E_v is the energy of a gain-scaled version of the pitch codevector and E_c is the energy of a gain-scaled version of the innovative codevector.

Claim 117 (Currently Amended): A bidirectional wireless communication sub-system as defined in claim 115, wherein said gain ~~adjusting unit~~ adjustment module comprises a means for calculating an energy scaling factor using the relation:

$$\textit{Energy scaling factor} = \sqrt{\frac{\sum_{n=0}^{N-1} u'^2(n)}{\sum_{n=0}^{N'-1} w'^2(n)}} \quad , n = 0, \ldots, N'-1,$$

where w' is said white noise sequence ~~and~~ , u' is an enhanced excitation signal derived from said excitation signal, N' is a length of the white noise sequence and N is a subframe length.

Claim 118 (Currently Amended): A bidirectional wireless communication sub-system as defined in claim 115, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 1 - tilt \qquad \text{bounded by } 0.2 \leq g_t \leq 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,
wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and n=0,...N-1.

Claim 119 (Currently Amended): A bidirectional wireless communication sub-system as defined in claim 115, wherein said spectral tilt calculator comprises a means for calculating said tilt scaling factor g_t using the relation :

$$g_t = 10^{-0.6tilt} \qquad \text{bounded by } 0.2 \leq g_t \leq 1.0$$

where *tilt* is a tilt factor given by :

$$tilt = \frac{\sum_{n=1}^{N-1} s_h(n) s_h(n-1)}{\sum_{n=0}^{N-1} s_h^2(n)}$$

conditioned by $tilt \geq 0$ et $tilt \geq r_v$,
wherein S_h is the synthesized signal, r_v is the voicing factor, N is a subframe length and $n=0,\ldots N-1$.

Claim 120 (Previously Presented): A bidirectional wireless communication sub-system as defined in claim 114, wherein said band-pass filter comprises a frequency bandwidth located between 5.6 kHz and 7.2 kHz.

Claim 121 (Previously Presented): A high-frequency content recovering device as defined in claim 61, wherein said spectral shaping unit comprises a spectral shaper for filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of the over-sampled synthesized signal version.

Claim 122 (Currently Amended): A high-frequency content recovering method as defined in claim 64, wherein said spectral shaping of the noise sequence comprises filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of the over-sampled synthesized ~~sound~~ signal version.

Claim 123 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 67, wherein said spectral shaping unit comprises a spectral shaper for filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of the over-sampled synthesized signal version.

Claim 124 (Previously Presented): A decoder for producing a synthesized wideband signal as defined in claim 76, wherein said spectral shaping unit comprises a spectral shaper for filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of the over-sampled synthesized signal version.

Claim 125 (Previously Presented): A cellular communication system as defined in claim 85, wherein said spectral shaping unit comprises a spectral shaper for filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of the over-sampled synthesized signal version.

Claim 126 (Currently Amended): A ~~cellular~~ mobile transmitter/receiver unit as defined in claim 94, wherein said spectral shaping unit comprises a spectral shaper for filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of the over-sampled synthesized signal version.

Claim 127 (Currently Amended): A ~~cellular~~ network element as defined in claim 103, wherein said spectral shaping unit comprises a spectral shaper for filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a frequency bandwidth of the over-sampled synthesized signal version.

Claim 128 (Previously Presented): A bidirectional wireless communication sub-system as defined in claim 112, wherein said spectral shaping unit comprises a spectral shaper for filtering the noise sequence in relation to a bandwidth expanded version of the linear prediction filter coefficients to produce a filtered noise sequence characterized by a frequency bandwidth generally higher than a

frequency bandwidth of the over-sampled synthesized signal version.